

What is claimed is:

1. A system for acquiring data indicating brain activity comprising, in combination,
a mechanical support frame adapted to be worn on a human head consisting of a plurality of mechanically connected rails, each of said rails including at least one data distribution conductor extending along substantially the entire length of said rail, the data distribution conductors in all of said rails being electrically connected together to form a data transmission network,
at least one data acquisition node mounted on one of said rails, said node data node including a sensor for acquiring data indicating brain activity from a localized area on said human head, said data node including means for transmitting said data via said power distribution conductor, and
a host node mounted on one of said rails for receiving data via said data distribution network for said data acquisition node and for relaying said data to an external utilization device.
2. A system for acquiring of data indicating brain activity as set forth in claim 1 wherein each of said rails in said support frame further includes a source of electrical power and a power distribution conductor extending along substantially the entire length of each of said rails, the power distribution conductors in said rails being electrically connected together and to said source of electrical power to form a power distribution network.
3. A system for acquiring of data indicating brain activity as set forth in claim 1 wherein said data node is mounted for adjustable movement along the rail upon which it is mounted and includes means for mechanically securing said data node in place at a desired position on said rail upon which it is mounted.
4. A system for acquiring of data indicating brain activity as set forth in claim 3 further including distribution nodes for mechanically connecting rails at an intersecting position, each of said distribution nodes being mounted for adjustable movement along one of said rails.

5. A system for acquiring of data indicating brain activity as set forth in claim 4 wherein said sensor is mounted on a probe mounted on said data node for movement toward and away from said human head.

6. A system for acquiring of data indicating brain activity as set forth in claim 5 wherein said sensor comprises a biopotential electrode adapted to establish electrical contact with the human skin.

7. A system for acquiring of data indicating brain activity as set forth in claim 6 wherein said data acquisition node includes means for resiliently forcing said biopotential electrode against the skin.

8. A system for acquiring of data indicating brain activity as set forth in claim 6 wherein said sensing probe extends through said data acquisition node and includes a biopotential electrode on the end adjacent to said human head and a control knob at the other end which permits said sensing probe to be twisted to establish better contact between said biopotential sensor and said human head.

9. A system for acquiring of data indicating brain activity as set forth in claim 1 where data node includes an analog-to-digital converter for converting data acquired by said sensor into digital data transmitted via said distribution network to said host node.

10. A system for acquiring of data indicating brain activity as set forth in claim 9 where digital data is serialized for transmission over two wires in said distribution network.

11. A system for acquiring of data indicating brain activity as set forth in claim 9 where each of said rails contains two or more parallel signal carrying conductors for simultaneously transmitting different data quantities.

12. A system for acquiring of data indicating brain activity as set forth in claim 1 wherein each of said rails further includes a reference signal conductor and system further comprises a reference node mounted on one of said rails for connecting said reference signal conductor to an external object.

13. A system for acquiring of data indicating brain activity as set forth in claim 1 where host node includes a radio communications transceiver for transmitting said data to an external utilization device.

14. A system for acquiring of data indicating brain activity as set forth in claim 1 wherein said intersecting rails are curved such that said support frame forms a helmet that defines an anatomically shaped cavity that surrounds and substantially conforms to the shape of said human head.

15. A system for acquiring of data indicating brain activity as set forth in claim 1 wherein said data acquisition node acquires electroencephalography data.

16. A system for acquiring of data indicating brain activity as set forth in claim 15 further comprising a plurality of further data acquisition nodes mounted on said rails.

17. A system for acquiring of data indicating brain activity as set forth in claim 16 wherein at least some of said further data acquisition nodes acquire electroencephalography data.

18. A system for acquiring of data indicating brain activity as set forth in claim 16 wherein at least some of said further data acquisition nodes acquires optical tomography imaging data.

19. A system for acquiring of data indicating brain activity as set forth in claim 16 wherein at least some of said further data acquisition nodes acquire electrocorticography data.

20. A system for acquiring of data indicating brain activity as set forth in claim 1 wherein said data acquisition node includes and acquires optical tomography imaging data.

21. A system for acquiring of data indicating brain activity as set forth in claim 1 wherein said data acquisition node acquires electrocorticography data.

22. A system for acquiring of data indicating brain activity as set forth in claim 1 wherein said data acquisition node includes a sensor for producing an analog electrical signal whose amplitude is indicative of brain activity and an amplifier having an input connected to said sensor for amplifying said analog signal.

23. A system for acquiring of data indicating brain activity as set forth in claim 22 wherein said amplifier is located less than 10 millimeters from said sensor.

24. A system for acquiring of data indicating brain activity as set forth in claim 1 wherein said data acquisition node includes a sensor for producing an analog electrical signal whose amplitude is indicative of brain activity and an analog-to-digital converter for producing a digital output signal having a value representing said amplitude for transmission via said data transmission network.

25. A system for acquiring of data indicating brain activity as set forth in claim 24 wherein said analog-to-digital converter is located less than 10 millimeters from said sensor.

26. A system for acquiring of data indicating brain activity as set forth in claim 1 wherein said rails are constructed of an electrically conductive material which provides shielding for said data distribution conductors.

27. A system for acquiring of data indicating brain activity as set forth in claim 26 wherein said electrically conductive material is aluminum.

28. A system for acquiring data indicating brain activity comprising, in combination, a rigid helmet defining an interior cavity shaped to conform to and be worn on a human head,

a plurality of data acquisition sensors attached to said helmet at adjustable spaced apart locations thereon, each of said sensors including a sensing element which extends inwardly from said helmet to a selected position on or near said human head,

and a radio transceiver mounted on said helmet for transmitting data acquired by said sensors to a remote data utilization device.

29. A system for acquiring data indicating brain activity as set forth in claim 28 wherein at least one of said data acquisition sensors is an electrode for establishing an electrically conductive contact with the skin at said selected position for acquiring data in the form of a biopotential signal.

30. A system for acquiring data indicating brain activity as set forth in claim 29 wherein at least one of said data acquisition sensors acquires optical tomography imaging data from said selected position on or near the human head.

31. A system for acquiring data indicating brain activity as set forth in claim 29 wherein said one of said data acquisition sensors further includes a resilient member for urging said electrically conductive contact against the skin.

32. A system for acquiring data indicating brain activity as set forth in claim 28 wherein at least one of said data acquisition sensors acquires optical tomography imaging data.

33. A system for acquiring data indicating brain activity as set forth in claim 28 wherein said radio transceiver transmits data acquired by said sensors in digital form to said remote data utilization device.

34. Apparatus for acquiring brain activity data comprising, in combination, a rigid helmet anatomically shaped to conform to the human head of a wearer, a plurality of data acquisition sensors attached to an adjustable location on said helmet, each of said sensors including a probe mounted for movement toward and away from said human head to position a sensing element at or near a selected position on the head, and a communications unit attached to said helmet for receiving sensing data from each of said sensors and for transmitting said sensing data to a utilization device external to said helmet.

35. Apparatus for acquiring brain activity data as set forth in claim 34 wherein at least one of said data acquisition sensors is an electrode for establishing an electrically conductive contact with the skin at said selected position for acquiring data in the form of a biopotential signal.

36. Apparatus for acquiring brain activity data as set forth in claim 35 wherein said one of said data acquisition sensors further includes a resilient member for urging said electrically conductive contact against the skin.

37. A system for acquiring data indicating brain activity as set forth in claim 34 wherein at least one of said data acquisition sensors acquires optical tomography imaging data.

38. A system for acquiring data indicating brain activity as set forth in claim 34 wherein said radio transceiver transmits data acquired by said sensors in digital form to said remote data utilization device.